

## Effect of Magnetic Field on the Corrosion Behavior in Carbon Steel Piping

373-1

19

가

가 가  
가

가 가

, 80

가

가 가

### Abstract

To explore the mitigation method of flow-accelerated corrosion using permanent magnet, this study was performed to evaluate the effect of magnetic field on the corrosion reaction of carbon steel at various temperatures. The magnetic field enhanced the corrosion rate at room temperature. At 80 the magnetic field effect did not appear up to 1,750 Gauss. At 80 the effect of magnetic field on the corrosion reaction turned out smaller than at room temperature. If the effect of magnetic field on the corrosion reaction is reduced with increasing temperature, and the magnetic field increase the mechanical stability of oxide film as the result of previous research. The magnetic method may be favorable as a mitigation method of the flow accelerated corrosion.

1.

( FAC) . 가  
 . 가 , 가  
 . 가 [1].  
 FAC 가 가 가  
 가 , FAC  
 . 가  
 (magnetite, Fe<sub>3</sub>O<sub>4</sub>) 가  
 FAC 가  
 가 , 가  
 가 .  
 FAC  
 가  
 가 ( RCE)

2.

1.

CANDU 1  
 1 Mol LiOH  
 pH 10.4 . pH 가  
 , CANDU 1  
 2  
 .  
 CANDU 1 (feeder) FAC  
 CANDU SA106 Gr.B  
 .  
 PWR SA106 Gr.C , ,  
 SA106 Gr.B , SA106 Gr.C

2.

1 RCE potentiostat, data  
RCE cell acquisition system RCE cell  
, , 가 .  
3000 rpm 가 DC  
SUS , potentiostat SUS  
. .  
4 baffle 90 ° .  
2 , 1 3-electrode system RCE  
cell .  
가 .  
case 3 window , window  
. 가 , 가 ,  
80 400W 2  
, 1 가 controller .  
SUS ,  
가 가 가 .  
30 , 50 , 80  
가 open-circuit potential ,  
2 cell 1  
, 80 1 SA106  
Gr.C open-circuit potential 가 가 가  
. .  
, 3  
SUS can .  
SUS ,  
SA106 Gr.C disk 가 .  
가 SUS  
can 가 , 가 teflon .  
SUS can SUS , galvanic  
teflon .  
edge effect  
10 가 teflon case .  
3 .  
Nd-Fe-B 2 2 ,

1 1750 Gauss ,

2 2900 Gauss .

KANETEC TM-501 tesla meter .

3.

CANDU 1

2 .

2 cathodic charging .

-1500 mV<sub>SCE</sub>

1 cathodic charging ,

EG&G model 362 scanning potentiostat -1500 mV<sub>SCE</sub> 800 mV<sub>SCE</sub> 1 mV/sec 가

가

IBM PC PCL 812pg AD converter 6 sec/# term

anodic cathodic

Stern-Geary [2]

3.

1.

4 , 가 0 rpm SA106

Gr.C . 가 가

가 ,

가

radical activity 가 free energy 가

, 50 가 가

가 , 80 50 . 50

80 50 80

가 . 2

5 . 0

rpm, 2900 Gauss , 가

가 .

1000 rpm ,

6 . 0 rpm, 0 Gauss 가 가  
 가 50 80  
 , 0 rpm 가 가  
 가 가 . 0 rpm 80  
 passive region 가 가  
 passive film 1000 rpm

8 가 가 가  
 linear method

9 가 가 가

2.

Mohanta-Fahidy steel 가 [3].  
 (MHD force)

electrode 가 가  
 가 . Blum et al 300

400% 가 [4]. 80  
 가 . 10 , 0 rpm 가 가  
 가 가 가  
 , 11 1750 Gauss 2900 Gauss  
 80 1750 Gauss 가

, 12 80 , 1000 rpm SA106 Gr.C  
 2900 Gauss

passive region 가 가 , 80  
 passive region 가 가

Linear method  
 13 14 가 가  
 가 가 , 80 가

가 가 가 가  
 FAC

4.

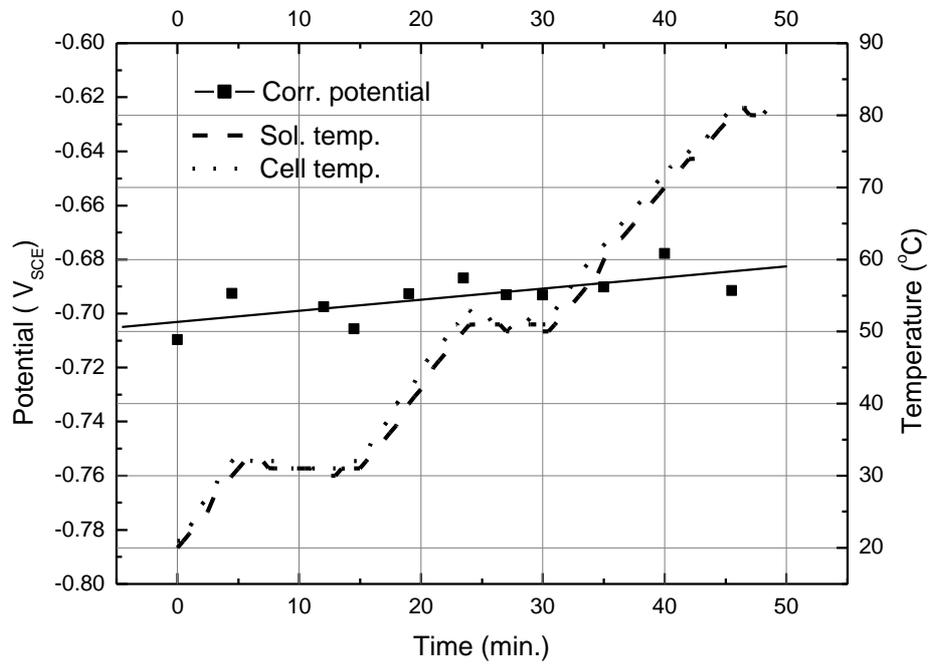
가  
RCE . 80 ,  
1500 rpm, 2900 Gauss , 80 1  
. 가 가 SA106 Gr.C cathodic  
, , passive region 가 . 가  
가 ,  
가 가 가 .  
가 .  
1 , 가  
pore  
. 가  
가 가 . 80 가  
가 .  
, 가 가  
가  
FAC .

(KINS/HR-433),

1. B. Chexal, et. al., EPRI TR-106611, (1996) 1-4
2. D. A. Jones, Principles and Prevention of CORROSION
3. S. Mohanta, T. Z. Fahidy, Electrochimica Acta, v.19, 1974, p.835.
4. S.I. Lisovskaya, E.J. Blum, P.B. Kulis, A.G. Fedin, Latvijas PSR Zinatnu Akademijas Vestis Fizikas un tehnisko Zinatnu Serija, n.3, 1970, p.69.



1.

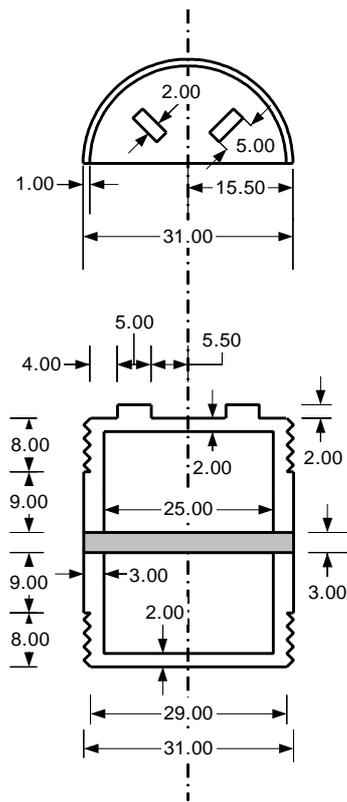


2.

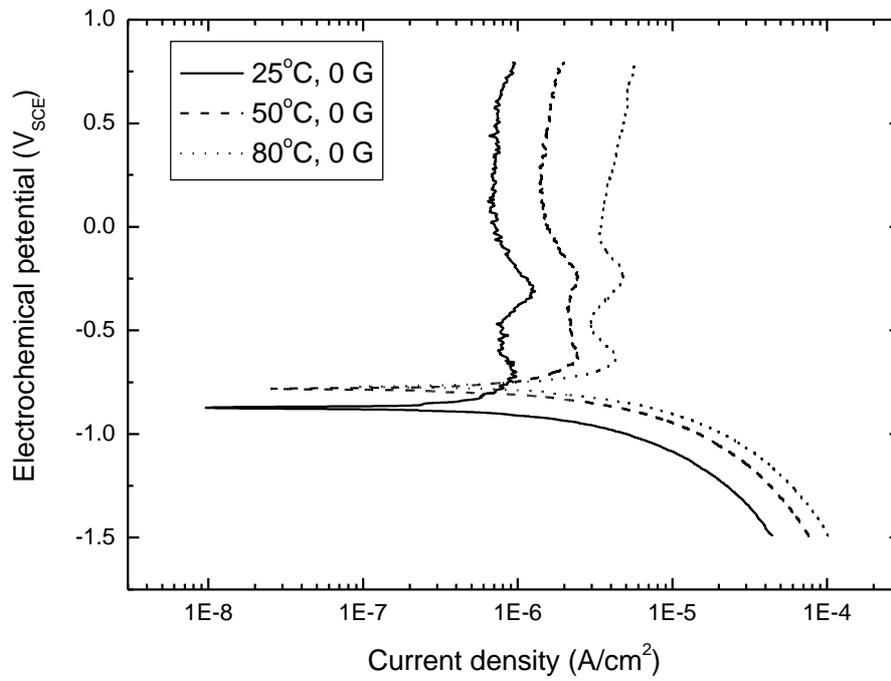
가

SA106 Gr.C

open-circuit potential



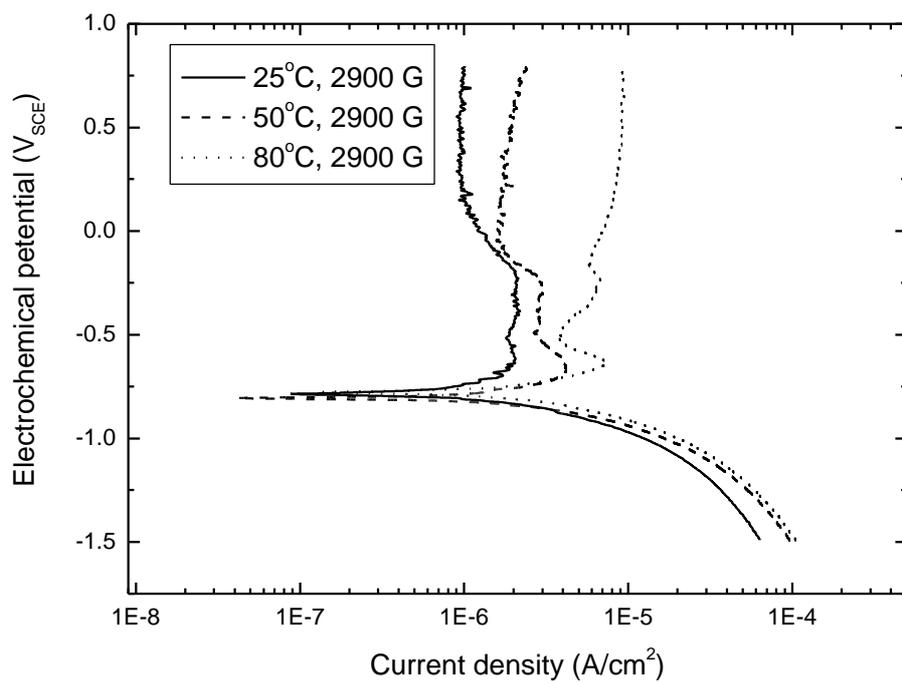
3. SUS can



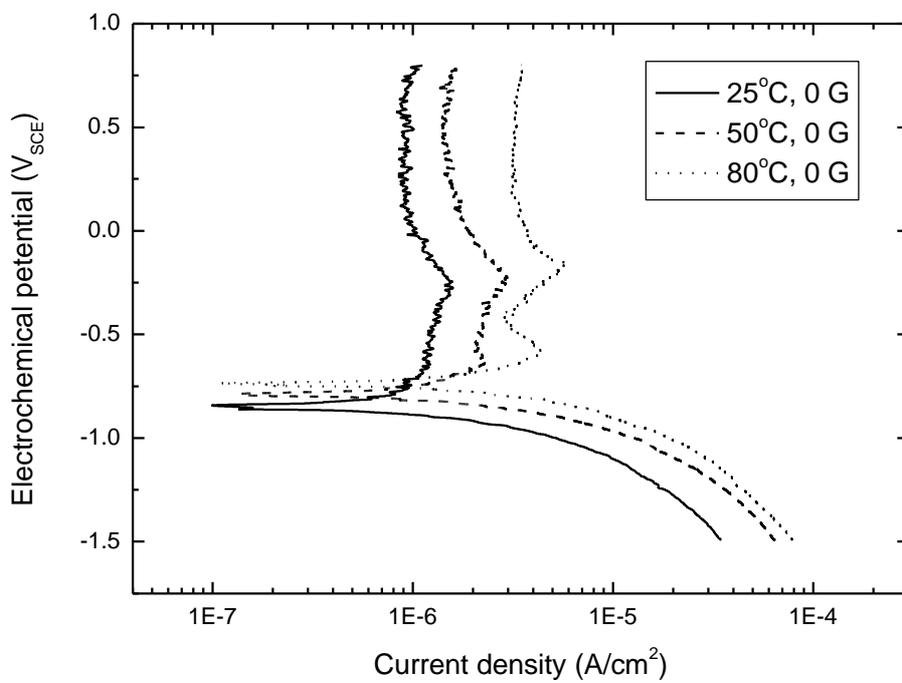
4. 0 rpm, 0 Gauss

, pH 10.4

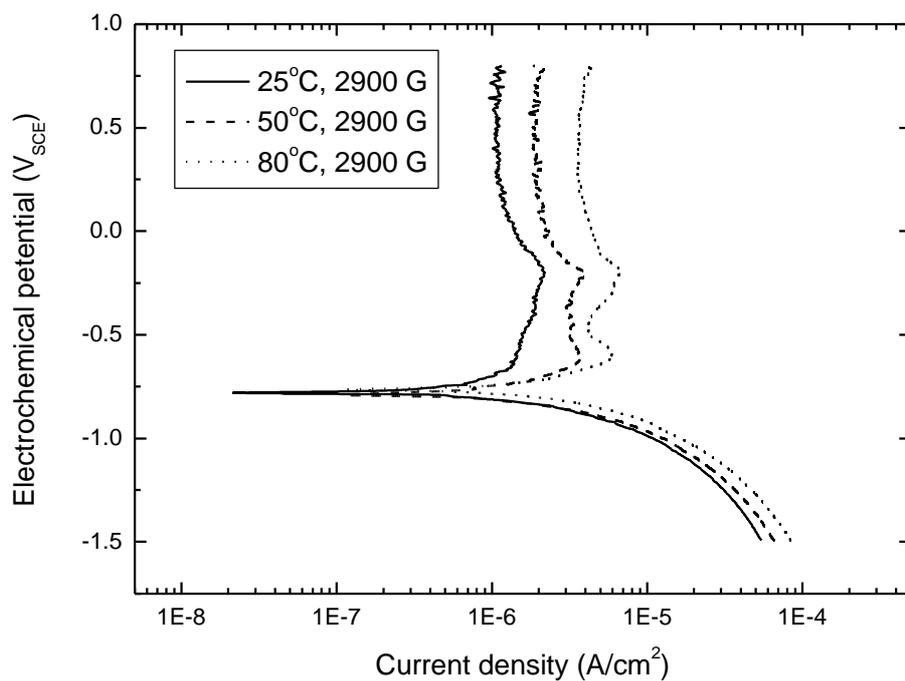
SA106 Gr.C



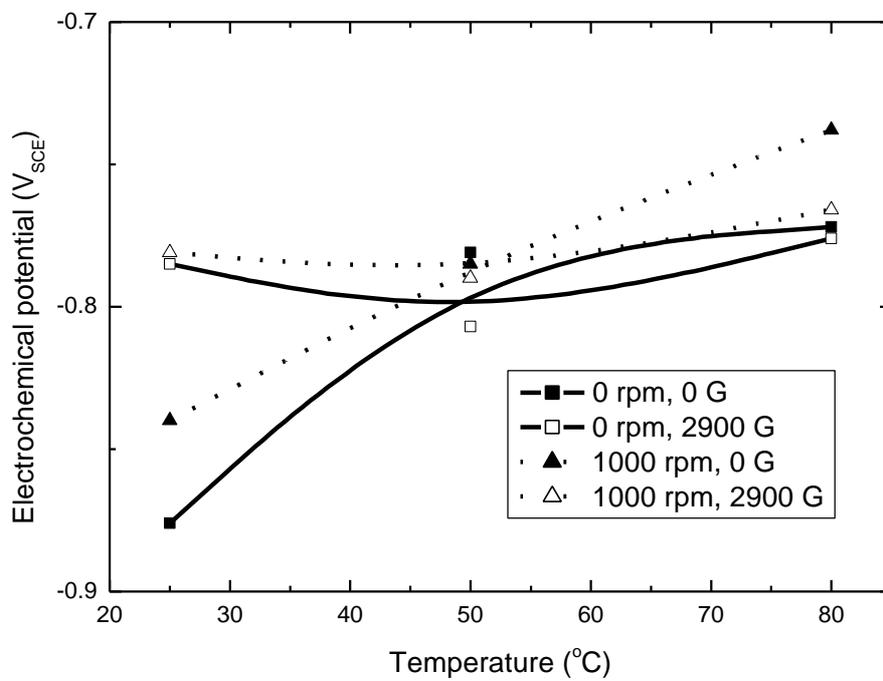
5. 0 rpm, 2900 Gauss



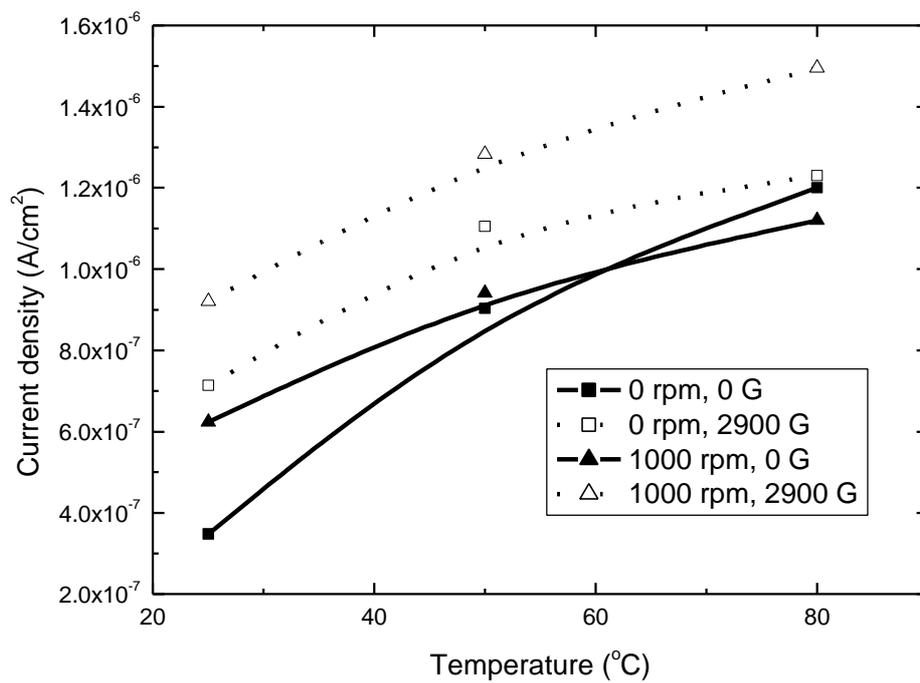
6. 1000 rpm, 0 Gauss



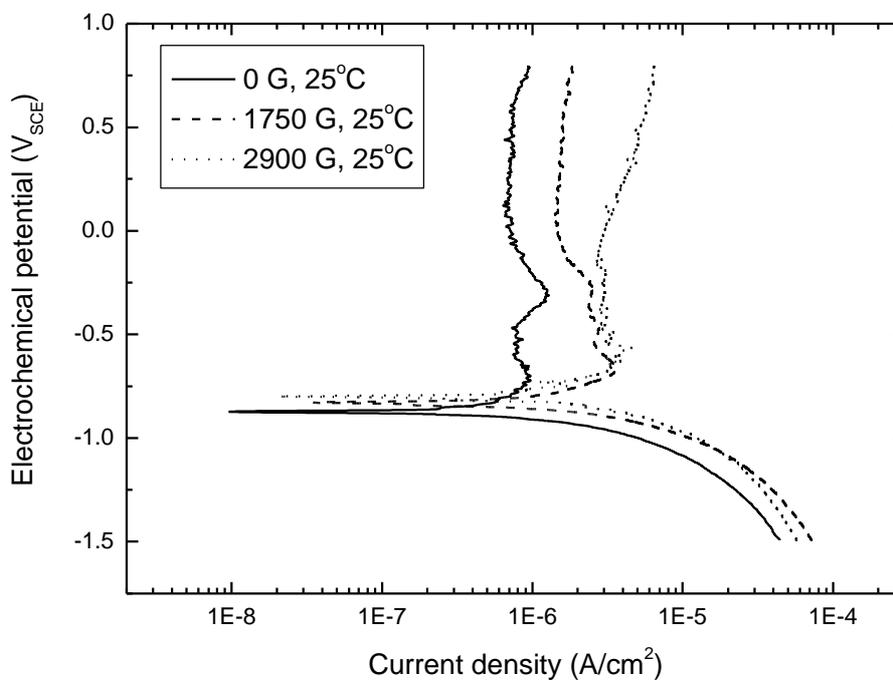
7. SA106 Gr.C      1000 rpm, 2900 Gauss



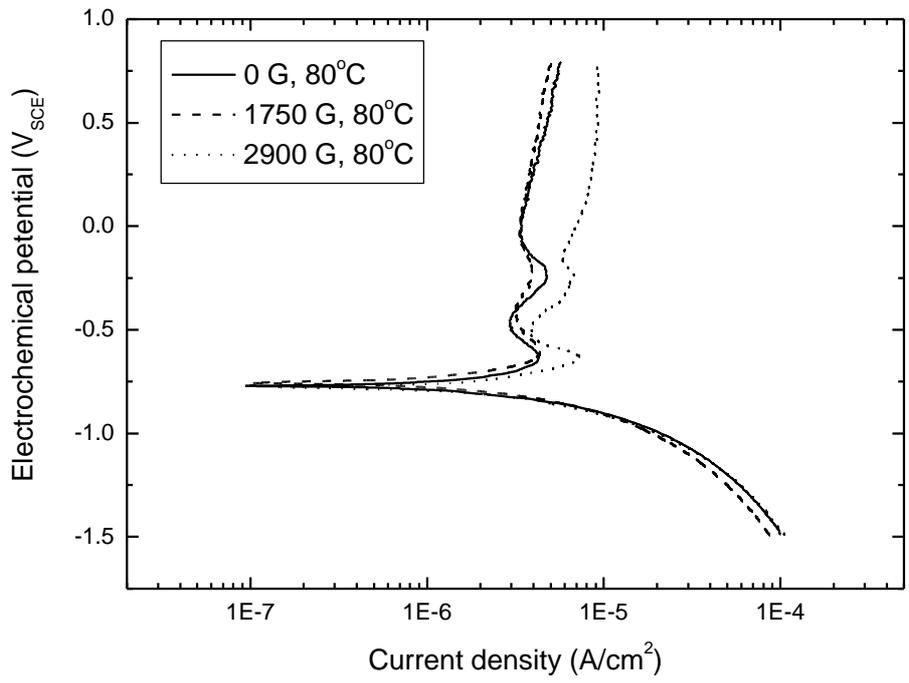
8.



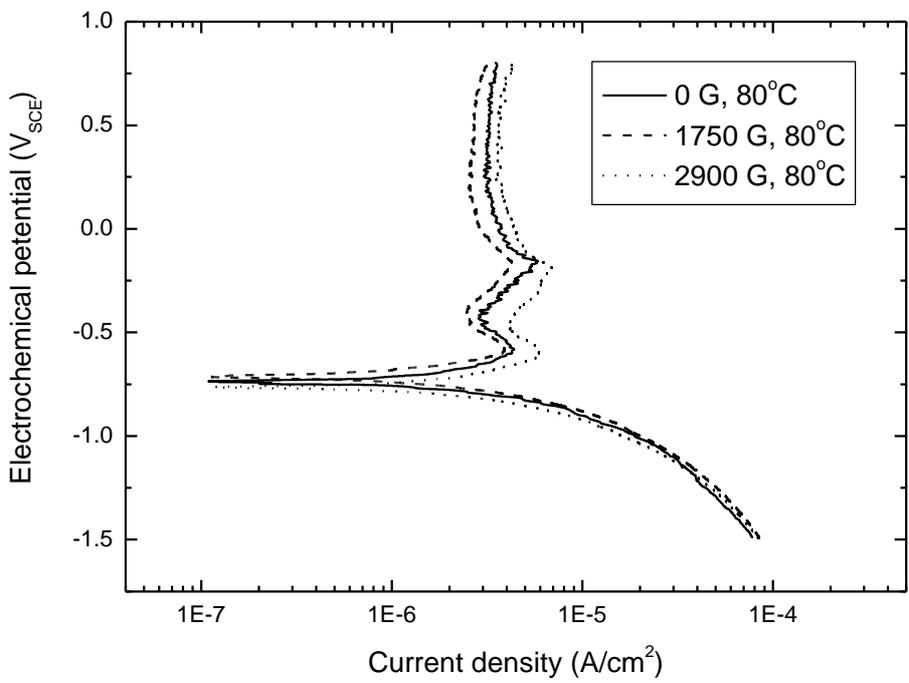
9.



10. , 0 rpm

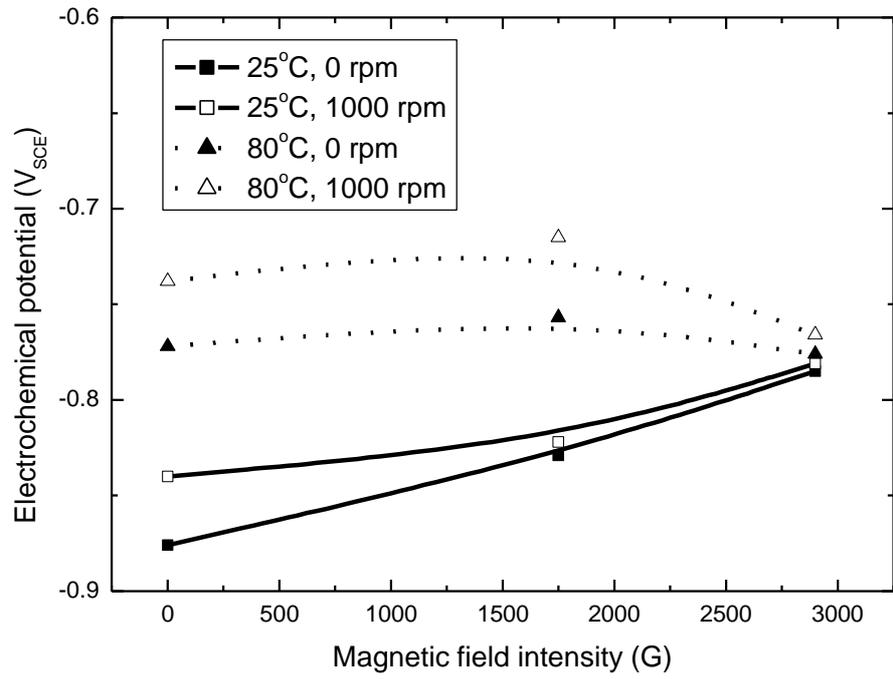


11. 80 , 0 rpm

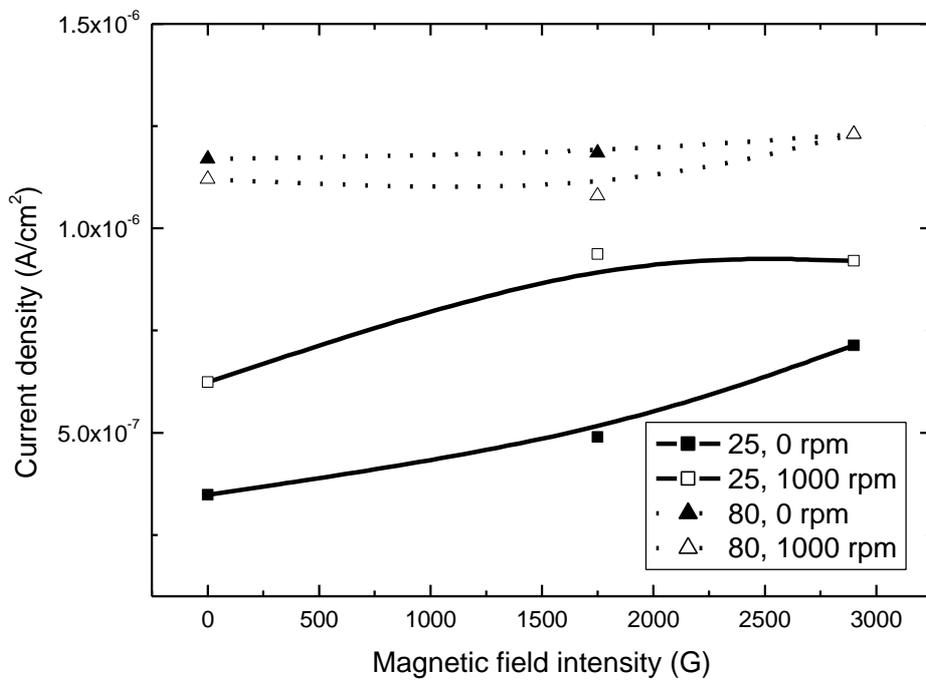


12. 80 , 1000 rpm

SA106 Gr.C



13.



14.